CLAIMS

1. A human eye detection method comprising the following steps:

a) Reading in an image;

b) Analyzing the image and getting a list of candidate eye areas;

c) selecting one unverified candidate eye area from said list;

d) determining a neighborhood region of the selected candidate eye area;

e) calculating the neighborhood region's size, which is recorded as S;

f) processing the region, obtaining dark areas;

g) counting the number of dark areas, which number is recorded as N;

h) comparing the ratio N/S to a predetermined first threshold; if the ratio N/S is smaller than said first threshold, the candidate eye area is determined as a real eye area and remains in the list; else, the candidate eye area is determined as a false eye area and deleted from the list;

i) repeating steps c) to h) until there is no unverified candidate eye area in the list; and

j) outputting the list for purpose of subsequent processing of the image.

2. The human eye detection method according to claim 1, characterized in that the method further comprising steps of:

determining candidate face areas on the basis of remanent candidate eye areas obtained from said step j);

deleting false face areas;

outputting the remanent face areas for subsequent processing.

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3. The human eye detection method according to Claim 2, characterized in that the determining step comprises, for each pair of remanent candidate eye areas, determing two candidate face areas based on the centers of said pair of candidate eye areas, the distance between said centers and the inherent ratios in the face of human being.

4. The human eye detection method according to any of claims 1 to 3, characterized in that, in step c), a batch of said unverified candidate eye areas is selected from the list, and the steps d) to h) are implemented for each unverified candidate eye area in the batch in parallel.

5. The human eye detection method according to any of claims 1 to 3, characterized in that, in step f), the dark areas are determined in the same way as that used in step b).

6. The human eye detection method according to any of claims 1 to 3, characterized in that, said step f) comprises a binarization step.

7. The human eye detection method according to any of claims 1 to 3, said first threshold is a previously stored value.

8. The human eye detection method according to any of claims 1 to 3, further comprising a threshold calculating step before the step h), for calculating said first threshold.

9. The human eye detection method according to any of claims 1 to 3, characterized in that the first threshold is in the range of 0.15-0.0015.

10. The human eye detection method according to claim 9, characterized in that the first threshold is 0.015.

11. A human eye detection apparatus (500) comprising: reading means (504) for reading in an image; candidate detection means (506) for analyzing the reading image and getting a list of candidate eye areas; and output means (512) for outputting the list for purpose of subsequent processing of the

image; characterized in that, the apparatus further comprises selecting means (507) for selecting one candidate eye area to be verified from the list, verifying means (508) for determining whether said one candidate eye area is a true eye area, and outputting the result; and controlling means (510) for controlling the selecting means so that all the candidate eye areas in the list are verified; and in that the verifying means (508) further including:

neighborhood region determining means (604) for determining a neighborhood region for the candidate eye area;

calculating means (608) for calculating the region's size, which is recorded as S;

dark area determining means (610) for processing the region and obtaining dark areas;

counting means (612) for counting the number of dark areas, which number is recorded as N; and

comparing means (614) for comparing the ratio N/S to a predetermined first threshold; if the ratio N/S is smaller than said first threshold, the candidate eye area is determined as a real eye area and remains in the list; else, the candidate eye area is determined as a false eye area and deleted from the list.

12. The human eye detection apparatus according to claim 11, characterized in that said dark area determining means (610) is binarization means.

13. The human eye detection apparatus according to claim 11, characterized in that said dark area determining means (610) is the same as said candidate detection means (506).

14. The human eye detection apparatus according to claim 11, characterized in that, it further comprises a threshold determining means for

calculating said first threshold.

15. A human eye detection system comprising:

an image source (502),

a human eye detection apparatus (500) according to claim 10, reading an image from said image source (502), processing the image and obtaining a list of eye candidate areas, and

a subsequent processing apparatus (516) for further processing the image using the list of eye candidate areas.

16. The human eye detection system according to claim 15, characterized in that the subsequent processing apparatus (516) is a human face determining device including:

candidate face determining means for determining face candidates on the basis of remanent candidate eye areas output from said human eye detection apparatus;

false face deleting means for deleting false face areas; and

output means for outputting the remanent face areas for subsequent processing.

17. The human eye detection system according to Claim 16, characterized that said candidate face determing means determines, for each pair of remanent candidate eye areas, two candidate face areas based on the centers of said pair of candidate eye areas, the distance between said centers and the inherent ratios in the face of human being

18. The human eye detection system according to anyf of claims 15-17, characterized in that said human eye detection apparatus (500) is the human eye detection apparatus as claimed in anyone of claims 12-14.

19. A storage medium having human eye detection program codes stored

therein, said human eye detection program codes comprising:

reading codes for reading in an image;

candidate detection codes for analyzing the reading image and getting a list of candidate eye areas;

selecting codes for selecting one candidate eye area to be verified from the list;

neighborhood region determining codes for determining a neighborhood region for the candidate eye area;

calculating codes for calculating the region's size, which is recorded as S;

dark area determining codes for processing the region and obtaining dark areas;

counting codes for counting the number of dark areas, which number is recorded as N;

comparing codes for comparing the ratio N/S to a predetermined first threshold; if the ratio N/S is smaller than said first threshold, the candidate eye area is determined as a real eye area and remains in the list; else, the candidate eye area is determined as a false eye area and deleted from the list;

controlling codes for controlling the selecting codes so that all the candidate eye areas in the list are verified; and

output codes for outputting the list for purpose of subsequent processing of the image.

20. A storage medium, characterized in that program codes for implementing the human eye detection method claimed in anyone of claims 2-10 are stored therein.